

The picture shows a small jet plane which can carry six people.

When taking off fully loaded the mass of the plane is 2560 kg. The two jet engines can exert a total thrust force of 8000 N and the friction force between the wheels and

the ground is 340 N. Both forces remain constant at these values during take off.

(i) Calculate the acceleration of the plane as it starts to move.

Solution:

$F = 8000\text{N}$ – total thrust force of the jet engines;

$F_{\text{fr}} = 340\text{N}$ – friction force between the wheels and the ground;

$m = 2560\text{ kg}$ – mass of the plane;

Newton's second law for the plane along X-axis:

$$F - F_{\text{fr}} = ma$$
$$a = \frac{F - F_{\text{fr}}}{m} = \frac{8000\text{N} - 340\text{N}}{2560\text{ kg}} = 3 \frac{\text{m}}{\text{s}^2}$$

Answer: acceleration of the plane is $3 \frac{\text{m}}{\text{s}^2}$ when it starts to move.

